SOME ECONOMIC ASPECTS OF FARM PLANNING FOR SOIL AND WATER CONSERVATION, MOUNT VERNON, OHIO

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CONTENTS

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Introduction

Although many cropping practices and mechanical measures may be used by the farmer to control erosion and maintain the productivity of the soil, conservation practices to be successful must be economically feasible as well as physically possible. Not only must these conservation measures be economically feasible from the long-time point of view, but they must not reduce the farm income during the transition period to such an extent that the farmer cannot adopt them. In this study consideration will be given to some of the problems that the farmers have encountered in adopting the recommended soil and water conservation programs in the Granny-Dry Creek Demonstration Area near Mount Vernon, Ohio. On the basis of the experience of these farmers, recommendations will be made for modifying some of the original conservation plans for a more effective farm organization.

The Granny-Dry Creek Demonstration Project was established for the purpose of developing cooperatively with the farmers demonstrations of proper land use and the application of necessary soil and water conservation practices. On each demonstration farm, detailed farm plans were developed by the Soil Conservation Service and the farmers in an effort to promote proper land use and the control of erosion. The principal methods recommended were: contour strip cropping, contour cultivation, a reduction in the acreage of depleting crops, the improvement of the meadows and permanent pastures, reforestation, and the protection of the woodlots from livestock.

1/ Project Supervisor, Department of Rural Economics and Rural Sociology, Ohio State University, and Division of Economic Research, Soil Conservation Service, United States Department of Agriculture. R. R. Kinney assisted in the collection and analysis of the data for 1940-41. Data for 1936-39 were collected by the Soil Conservation Service, Mount Vernon, Ohio.

All of these practices were not recommended for each farm. For example, contour strip cropping and contour cultivation were not recommended for level areas. Also no reduction in the acreage of depleting crops was recommended where the proper rotation was already being followed. To assist the farmers in making the necessary changes the Soil Conservation Service furnished some materials. For example, this agency contributed lime, fertilizer, and seed for the demonstration areas of alfalfa and permanent pasture. The Soil Conservation Service also reforested small areas for demonstration purposes.

General Description of the Agriculture of the Area 1/

Topography. The Granny-Dry Creek demonstration area comprises approximately 32,000 acres of land located between the Granny and Dry Creeks in Knox and Morrow Counties. This area represents in a general way approximately two million acres of land in central Ohio. The soils are composed principally of the Cardington and Bennington soil series derived from glacial sandstone and shale. Moderately heavy subsoils characterize these soils and thus prevent proper drainage. In addition to the preceding soil types, small areas of Alexandria, Rittman, and Chenango soils are found in the watershed.

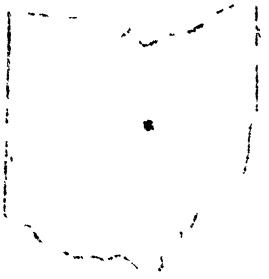

Figure 1.- Location of Granny-Dry Creek Demonstration Project

The topography is undulating to hilly with many small hills or hummocks having short steep slopes. The slopes on approximately 20 percent of the area are less than 3 percent; on 60 percent of the area they range from 3 percent to 12 percent; and on 20 percent of the area they are greater than 12 percent. That these slopes present a problem in erosion control is shown by the estimate that on approximately one-half of the total farm area more than three-fourths of the original topsoil has been removed by erosion.

1/ A detailed description of the area is given in the Granny-Dry Creek monograph which is available in the offices of the Regional Conservator and the State Coordinator.

Land Use.- Table I shows the land use on 54 farms on which detailed farm records were obtained, previous to any changes made by the Soil Conservation Service. Forty-three percent of the total farm area was rotated with 65 percent in depleting crops and 35 percent in conserving crops. The prevailing rotation was corn, wheat, meadow, but on some farms a few acres were used to produce oats and soybeans. These 54 farms ranged in size from 34 to 320 acres with 31 percent in the 60 to 100 acre group, and 41 percent in the 101 to 140 acre group. The majority of the farms may be classified as the one-man type, operated by the owner with the help of family labor. In 1935, 48 of the 54 farms were operated by the owners, 3 farms were rented for cash, and 3 farms were rented for a share of the crops. On a small number of farms the operator rented, from a neighbor, a few acres for corn and pasture.

Table I.- Land Use on 54 Farms in 1935
Granny-Dry Creek Area

Crop	Average Acreage per farm
Corn, grain	14.3
Corn, silage	1.0
Oats	3.0
Wheat and rye	11.4
Soybeans	3.0
Other depleting crops	1.1
Total depleting crops	33.8
Clover hay and seed	3.0
Clover-timothy hay	7.1
Timothy hay and seed	2.8
Rotation pasture	3.0
Idle land	2.5
Total rotated area	52.2
Permanent pasture	51.1
Woods	9.9
Roads, buildings, waste	8.2
Total farm area	121.4

Livestock.- General livestock farming is followed on practically all of the farms in the area. The prevailing practice is to market the crops through livestock and their products. On some farms grain is purchased to supply the needs of the

livestock. The average amount of livestock kept on the 54 farms in 1935 consisted of the following numbers of animal units: 1/ horses 2.6, cows 7.2, other cattle 2.5, sheep 7.6, hogs 1.4, and poultry 2.0 making a total of 23.3 animal units. The labor income per farm for 1935, the only year in which income records were obtained averaged approximately $800. Farm receipts during this year averaged 85 percent from livestock, 10 percent from crops, and 5 percent from miscellaneous sources. The sale of market milk and eggs accounted for two-thirds of the receipts from livestock products.

The Program Recommended by the Soil Conservation Service

For controlling erosion and maintaining the productivity of the soil the following practices were recommended: (1) proper land use, (2) approved rotations, (3) improvement of the meadows and permanent pasture, (4) contour strip cropping, (5) contour cultivation, (6) sod waterways and (7) woodland management. The recommended rotation included corn, wheat and two years of meadow. To provide some legume hay in the second year meadows the following seeding mixture was suggested: 4 pounds of alfalfa, 4 pounds of red clover, 2 pounds of alsike clover, and 4 pounds of timothy seed, the latter to be sowed in the fall. Also, approximately 2-1/2 tons of ground limestone per acre was recommended for the initial treatment of the cropland, and one ton per acre once every rotation thereafter. In cases where a high proportion of alfalfa was desired, the above meadow-mixture was changed to include more alfalfa and less red clover as the land increased in productivity.

No mechanical means were recommended for controlling erosion on slopes below 3 percent. On slopes from 3 percent to 7 percent where erosion is slight contour cultivation should be followed, but on these slopes where erosion is severe contour strip cropping was recommended. On all cropland with slopes from 7 percent to 18 percent, contour strip cropping was deemed necessary, the width of the strips depending upon the length and steepness of the slopes. Land with slopes above 18 percent should be

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1/ An animal unit is equal to: 1 horse, 1 cow, 2 head of young cattle, 10 ewes, 20 lambs, 3 brood sows, 1400 lbs. gain in hogs, or 100 hens.

converted to permanent pasture or woods, depending upon the amount of pasture needed and the degree of erosion.

For improving the permanent pasture, an initial application of approximately 2 tons of ground limestone and the equivalent of 400 pounds of 20 percent superphosphate fertilizer per acre was recommended. Subsequent treatments called for one ton of ground limestone and the equivalent of 400 pounds of 20 percent superphosphate fertilizer once every five to six years.

The forestry improvement program included the protection of the woods from livestock, the cutting of undesirable trees, the planting of trees where needed, the protection of the trees from fire, and the marketing of the trees as they mature.

Problems Involved in Changing Rotations

Feed Available.- The sudden change from a three-year rotation of corn, wheat, meadow to a four-year rotation of corn, wheat, meadow, meadow, has seriously upset the farm organization on some of the farms in the Granny-Dry Creek Demonstration Area. For example, 13 of 46 farmers interviewed in 1942 had failed to adjust the farm organization to the recommended rotation consisting of two years of meadow. Some of these 13 farmers had already gone back to the prevailing three-year rotation, and the remainder were planning to do so in the near future. An analysis of the criticisms of the 13 farmers regarding the four-year rotation showed that:

4 objected to too much timothy hay and not enough corn.

3 objected to too much timothy hay.

3 objected to not enough corn.

1 objected to too much hay.

1 objected to too much hay and not enough corn.

1 did not have adequate storage space for the hay.

As a basis for studying some of the criticisms of the four-year rotation consideration will be given to the effects of reorganizing a typical farm. This farm was

selected for study since it approached very closely the average of the farms for the area (See Appendix tables A and B). Table II gives the prevailing land use in 1935, the proposed land use, and the crops grown during the transition period. Under the revised farm plans provisions have been made to change the rotation from corn, wheat, meadow to corn, wheat, meadow, meadow, and also eliminate the small acreage of soybeans. During the year 1940, the acreage of corn was slightly below the planned acreage due to compliance with the Agricultural Conservation Program. However, in 1942 this farmer plans to return to the corn, wheat, meadow rotation and raise approximately 15 acres of corn. Too much timothy hay and not enough corn were the reasons given for not continuing the recommended four-year rotation.

Table II.- Land Use on a 118 Acre Farm
Granny-Dry Creek Area

Crop	1936	1938	1939	1940	1941	S.C.S. plans
Corn	16	12	13	10	12	12-1/2
Wheat	16	14	12	14	10	12-1/2
Soybeans	4	0	0	0	2	0
Alfalfa-clover-timothy hay	0	0	0	12	0	25
Clover hay	0	16	13	0	13	0
Clover-timothy hay	16	0	12	0	0	0
Timothy hay	0	0	0	13	12	0
Total hay	16	16	25	25	25	25
Total rotated area	52	42	50	49	49	50
Woods	9	9	9	9	9	9
Permanent pasture	53	63	55	56	56	55
Idle and misc.	4	4	4	4	4	4
Total	118	118	118	118	118	118

The amount and type of livestock kept is shown in table III. The usual practice is to feed all of the crops to the livestock except wheat which is sold as a cash crop. With the exception of aproximately three animal units of hogs and poultry the livestock numbers consist of hay-consuming animals. Thus, a high proportion of roughage may be included in the livestock rations provided it is of high quality.

Table III.- Animal Units a/ of Livestock Kept on a 118 Acre Farm, Granny-Dry Creek Area

Class	1936	1938	1939	1941
Horses	2	2	2	2
Dairy cows	9	8	8	9
Other cattle	3	3	3	3
Sheep	4	3	2	6
Hogs	2	2	2	2
Poultry	1	1	1	1
Total	21	19	18	23

a/ An animal unit is equal to: 1 horse, 1 cow, 2 head of young cattle, 10 ewes, 20 lambs, 3 brood sows, 1400 lbs. gain in hogs, or 100 hens.

In order to compare the amount of feed available under the prevailing and proposed cropping practices, and also during the transition period, calculations have been made in table IV. In these computations yields have been held constant except for minor increases which may be expected from water conservation. Thus the effects of such factors as weather, improved varieties, and heavier application of fertilizer have been eliminated as variables. According to calculations less grain and more hay will be available under the 4-year rotation recommended by the Soil Conservation Service. Also, if the land is limed and an alfalfa-clover-timothy mixture of hay is raised, the hay produced will be of higher quality than under the prevailing methods where clover-timothy was raised. Therefore, some hay could be substituted for grain in the ration of the hay-consuming animals without reducing production. On the other hand, if more hay of higher quality were fed, and no reduction was made in the amount of grain in the ration, production could be expected to increase. In either case with plenty of good quality hay the amount of grain in the ration may be reduced to the minimum.

If a corn, wheat, meadow, meadow rotation is followed and no alfalfa is obtained in the meadows the situation will be similar to the calculations for the transition

Table IV.- Calculated Amount of Feed Available Under the Prevailing, Transition, and Proposed Methods of Farming for a 118 Acre Farm, Granny-Dry Creek Area

Crop	Prevailing	Transition	Proposed
Corn, bu.	672 a/	562 b/	562 b/
Wheat, bu.	288 a/	237 b/	237 b/
Total grain, feed units c/	989	823	823
Soybean hay, tons	6 a/	0	0
Alfalfa-clover-timothy hay, tons	0	0	50 b/
Clover hay, tons	0	16 b/	0
Clover-timothy hay, tons	18 a/	0	0
Timothy hay, tons	0	16 b/	0

a/ Based on 1936 acreage of crops and following yields: corn, 42 bu.; wheat, 18 bu.; soybean hay, 1.5 tons; and clover-timothy hay, 1.1 tons per acre.

b/ Based on proposed acreage of crops and following yields: corn, 45 bu.; wheat, 19 bu.; alfalfa-clover-timothy hay, 2.0 tons; clover hay, 1.3 tons; and timothy hay 1.3 tons per acre.

c/ A feed unit is equal to: 1 bu. corn or .9 bu. wheat.

stage in table IV. Under these conditions less grain but more hay will be produced, however, on most farms one-half of the hay will be timothy. Therefore, hay cannot be substituted for grain to any great extent consequently the production of livestock and their products may actually decline under the new farm organization. The experience of these 13 farmers indicates that the chances for the success of the four year rotation are small unless hay of the highest quality can be raised to offset the reduction in the amount of grain produced. An analysis of the type of second-year meadows on these farms showed that they were principally timothy since only 2 out of 8 farmers who seeded alfalfa obtained a satisfactory stand, and 5 of the farmers who did not seed alfalfa were of the opinion that they could not raise this crop due to lack of lime or poorly drained soils. On the basis of the experience of these farmers, the procedure to follow in many cases would seem to be to improve the cropland and grow an alfalfa-clover-timothy mixture of hay before reducing the acreage of corn.

Although 13 of the 46 farmers who were interviewed in this study stated that the four-year rotation was unsatisfactory, 33 of the farmers were planning to continue the recommended rotation. In many cases more than one factor contributed to the success of the recommended rotation, however an attempt was made to classify the farmers on the basis of the major reason why they were able to follow the suggested 4 year rotation. An analysis of these reasons showed that:

10 farmers had hay of higher quality.

9 farmers were curtailing farm operations.

8 farmers were contour strip cropping.

4 farmers received incomes from other sources.

2 farmers rented additional land.

As stated previously, the success of a corn, wheat, meadow, meadow rotation will depend greatly on the type of hay obtained in the second year meadows. If hay of high quality cannot be produced, the reduction in grain on many of the farms cannot be offset by feeding more hay. Ten of the 33 farmers who were planning to continue the four-year rotation were feeding better hay and some had increased the amount fed per unit of livestock. Six of these 10 farmers were raising alfalfa-clover-timothy hay, while the remaining 4 farm operators had improved the stands of red clover. Perhaps another factor that contributed to the continuation of the recommended rotation on these 10 farms was the age of the operator. The average age of the 10 farmers was 56 years compared with 49 years for the 13 farmers who were planning to return to the corn, wheat, meadow rotation. By using hybrid corn some farmers have been able to produce approximately as much corn under the revised farm plans as under the prevailing methods of farming.

Farmers who curtail farm operations in this area often drift into a four-year rotation by reducing the acreage of grain. This situation seemed to contribute to the continuation of the recommended rotation on 9 of the farms. Two of these 9 farmers had poor health and 7 averaged 63 years of age.

Eight of the 33 farmers were following contour strip cropping and were of the opinion that the advantages from this practice more than balanced the disadvantages of changing the rotation. On farms where contour-strip cropping should be followed to control erosion the change from a corn, wheat, meadow rotation to a corn, wheat, meadow, meadow rotation is essential if erosion control is to be most effective. This change is necessary to provide alternate strips of meadow and grain crops. On 6 of the 33 farms adjustments to the four-year rotation were made through the assistance of outside incomes, and land rented on nearby farms.

The experience of these 33 farmers would indicate that some serious problems often arise when the rotation is changed to include two years of meadow when an alfalfa hay mixture cannot be raised. Considerable timothy hay was produced on the second-year meadows since only 14 of the 25 farmers who seeded alfalfa obtained a satisfactory stand, and the remaining 8 farmers sowed only red clover and timothy seed.

In comparing the amount of feed produced under the recommended and prevailing rotations, consideration should be given to the long-time as well as the short-time effects. Calculations in table IV are based principally upon the short-time effects, and thus proper consideration is not given to the losses from soil depletion. This was done intentionally in order to stress the way in which many farmers analyze the economic aspects of the recommended soil and water conservation program.

According to computations for the 46 farms, farming methods under the prevailing three-year rotation were depleting the cropland at the annual rate of .5 percent. 1/ Thus, over a long period of time the yields would decline below the calculations for the prevailing practices in table IV. On the basis of the methods used during the period 1938-41 the productivity of the cropland was estimated to be increasing at the

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1/ This method of calculating the rate of soil depletion was developed by the Ohio Agricultural Experiment Station and is based on the percentage of depleting and conserving crops in the rotation, fertility practices, and erosion control. For example, each crop of corn is estimated to deplete the productivity of the soil 2 percent, wheat 1 percent, and oats 1 percent. First year alfalfa is estimated to increase the productivity of the soil 2-1/2 percent and red clover 2 percent. Other crops were calculated at their respective values which were based on experimental data. Credit was given also to the beneficial effects of fertilizer and manure, and erosion control practices.

annual rate of .1 percent. Estimates also show an annual increase of .4 percent in the productivity of the cropland when the recommended practices are in complete operation. These increases in soil productivity are due to a reduction in depleting crops, a decrease in erosion losses, and an increase in conserving crops.

The value of liming the cropland, at least to the point where red clover can be raised, has been demonstrated to practically all of the 46 farmers. Out of this group only 3 farmers will not continue to lime the cropland. Two of these farmers were tenants whose landlords did not recognize the need of liming the soil, and the other farmer was curtailing farm operations due to poor health.

Labor and Power.- Changing the rotation from corn, wheat, meadow to corn, wheat, meadow, meadow will result in a reduction in the labor and power demands for crop production. For example, computations for the 118 acre case farm show a reduction in man hours from 964 under the prevailing methods of farming to 809 under the revised farm plans. Also the estimated number of horse hours have been calculated to decrease from 1124 to 932 hours. Figure 2 shows that although less labor will be used under the four-year rotation, the distribution thereof during the production season will be less desirable than under the prevailing three-year rotation. This change in the distribution of labor has created serious problems on some of the farms. For example, 14 of the 46 farmers had difficulty in making all of the hay. Four of these farmers had poor health and 10 of the farmers did not have an adequate supply of labor. Recent improvements in the small tractor, the combine and the corn picker have reduced the labor demands and have enabled many farmers to produce grain crops without hiring any additional labor.

Since the present methods of harvesting hay on most farms are the same as they were 20 years ago, this crop is often more difficult to handle than the grain crops. The recent introduction of the power drawn sweep rake and the pick-up baler may enable many farmers to solve the problem of making more hay. However, on rolling land the sweep rake may be difficult to use, and the pick-up baler is often unsatisfactory when

the farm operator depends upon a custom outfit. If one or two farmers purchase a pick-up baler, the investment in machinery will be increased considerably. Although the period of making hay may be extended over more time than is indicated in figure 2, the quality of the hay will be reduced greatly if the hay is harvested too late. Also if maximum returns are to be obtained from the second cutting of hay, the first crop must be harvested at the proper time. Harvesting more hay often creates less serious problems on small farms than on the farms that are highly mechanized for grain production.

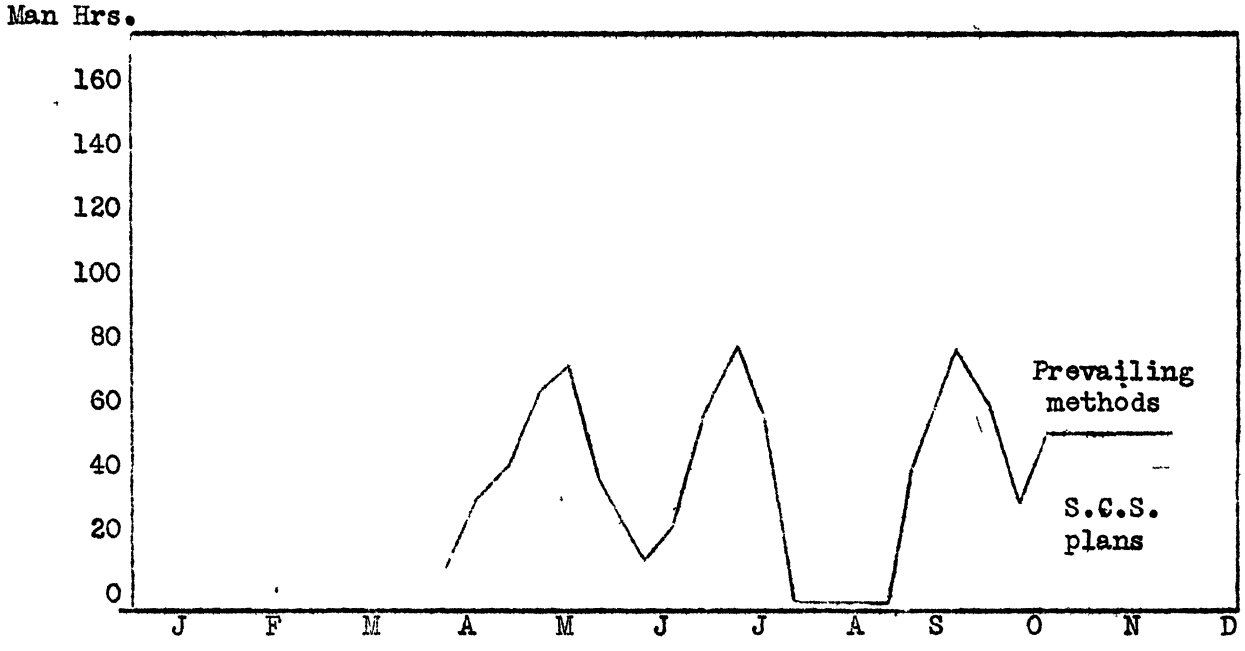

Figure 2.- Labor distribution on a 118 acre farm, Granny-Dry Creek Area

Source: Appendix Table E.

Adequacy of buildings.- Raising more hay often creates the problem of providing more storage space for this crop, and also more room to house additional hay-consuming livestock. Fourteen of the 46 farmers interviewed stated that the present buildings were inadequate under the new farm organization. Nine of these farmers were forced to stack some of the additional hay even though this practice increased the labor

demands and resulted in some loss of hay from exposure to the weather. On farms where no timber is available, the construction of additional barn space involves a cash outlay which may be needed for improving the land according to recommended soil and water conservation practices. One farmer stated definitely that he could not follow the recommended rotation because his barn was too small, and since he could not finance an addition to the present barn he had returned to the prevailing rotation of corn, wheat, and meadow.

Financial Returns or Income.- On many farms the success of the recommended corn, wheat, meadow, meadow rotation will depend upon at least three conditions. First, the second year meadows must consist of a mixture of alfalfa, clover, and timothy. Second, the hay must be made at the proper time. Third, the proper amount and type of livestock must be available to consume the hay produced. If all of these conditions are met, the adoption of the four-year rotation should be economically feasible, especially when consideration is given to the maintenance of the productivity of the soil.

If an alfalfa-clover-timothy mixture of hay cannot be obtained in the second-year meadows several alternative uses of the timothy meadows should be considered. One alternative would be to feed the timothy hay to the horses, or other livestock which use feed principally for maintenance. Other alternatives would include harvesting the timothy seed, selling timothy hay, pasturing the timothy meadows, or turning the timothy crop under to supply organic matter for the soil. In many cases these alternatives would reduce the farm income on the small farm because a less intensive type of farming would be followed. On farms where the volume of business is too small to permit the use of soil conservation methods, the farming unit becomes submarginal and cannot be operated as such over a long period of time. On the large farm where hired labor represents a large proportion of the current operating expenses, farm income may be maintained by reducing this item since less labor is used when the crops are not harvested and fed to livestock.

Although a corn, wheat, meadow, meadow rotation may be as profitable as a corn, wheat, meadow rotation, provided some alfalfa is obtained in the second year meadows and the additional hay is fed to efficient livestock, this may not be the case during the transition period. For example, the sudden adoption of the recommended conservation practices will often reduce the amount of grain produced, increase the amount of timothy hay raised, and increase the immediate expenditures for liming and fertilizing the cropland and permanent pasture. Therefore, many farmers will find that the adoption of conservation practices must be spread over a period of years to be economically feasible. The coordination of the livestock and crop enterprises is also essential for the success of the recommended four-year rotation.

Problems Involved in Contour Strip Cropping

If contour strip cropping is to be most effective strips of grain must be alternated with strips of sod. Alternate strips of grain and sod are possible with a corn, wheat, meadow, meadow rotation but not with a three-year rotation of corn, wheat, and one year of meadow. Therefore, contour strip cropping will necessitate the adoption of the recommended four-year rotation which will create all of the problems previously discussed under changes in rotation.

Since only a small proportion of the area has regular slopes that can be contour strip cropped, recommendations included this practice for only 14 of the 46 farms. On 11 of these 14 farms the operators plan to continue the practice, but on 3 of the farms contour strip cropping will be discontinued. Two of the 3 farmers objected to the small strips and point rows. The other farmer had difficulty in pasturing the meadow strips, and was therefore going back to the prevailing methods of farming.

One of the most serious problems associated with contour strip cropping is that of pasturing the meadow strips. Five of the farmers who followed contour strip cropping were unable to solve this problem. On many farms electric fence has not proved satisfactory for fencing small strips. Some of the farmers have pastured the

contour strip cropped areas after the hay and wheat were harvested. This method however can be used only with alternate strips of wheat and meadow which include only one-half of the contour strip cropped land. The other half of the contour strip cropped area would be in alternate strips of corn and meadow. If the wheat and hay fields are pastured after the crops are harvested, precautions should be taken to protect the new meadow seedings from over-grazing.

According to the experience of the 14 farmers who followed contour strip cropping no serious problems were created in regard to labor and power use. Twelve of these farmers indicated no change in the amount of labor used when strip cropping was followed, and 2 farmers thought that this practice had reduced labor quantities slightly. Seven of the 14 farmers stated that contour strip cropping was easier on the horses, while the remaining 7 operators had noticed no change in power demands.

Problems of Contour Cultivation

Some of the objections to contour cultivation are short rows, point rows, and sharp bends which interfere with the cultivation of the corn and also the harvesting of this crop with a corn binder. A survey of the 46 farms showed that contour cultivation had been planned on 29 farms, and would be continued in a modified form on 17 of the farms. In most cases some of the point rows would be eliminated, and some of the curves would be straightened in order to reduce the number of rows that ended in the middle of the fields. Five of the 12 farmers who plan to discontinue contour cultivation did not think this practice was necessary, while the remaining 7 farmers objected to the inconvenience of this erosion control practice. Contour cultivation is difficult to put into practice on the short steep slopes in this area where long rows without sharp bends are impossible unless considerable deviations from the contour are made. Contour cultivation provides no permanent marks showing where the rows should go each time, which is in contrast to contour strip cropping where only one-half of the land is plowed at any one time.

In regard to the changes in the labor and power demands contour cultivation created no serious problems on the 29 farms. Twenty-seven of these farmers noticed no change in the labor requirements, while 2 thought that contour cultivation had reduced the labor used slightly. Twenty-five of these farmers were of the opinion that this practice did not change the power demands, while 4 farmers indicated that less power was used.

Problems in Improving the Pasture

On most farms no permanent pasture is treated until sufficient lime and fertilizer has been applied to the cropland. This is usually due to the belief that lime and fertilizer will give greater returns on the cropland than on the permanent pasture. Also many farmers do not recognize the need for more permanent pasture of higher quality. In 1941 approximately 18 percent of the permanent pasture had been treated with lime and fertilizer of which one-half had been furnished by the Soil Conservation Service and the remainder by the farmers.

A survey of the 46 farms showed that 19 of the farm operators planned to discontinue the permanent pasture improvement program. Nine of these 19 farmers stated that the practice was unprofitable, 5 thought they had plenty of pasture, 3 were tenants, and 2 were curtailing farm operations due to poor health.

In regard to the adequacy of the permanent pasture 28 of the 46 farmers stated that they had enough pasture. This group of farmers had an average of 3.3 acres of permanent pasture per roughage consuming animal unit, and had treated an average of 12 acres per farm. The remaining 18 farmers expressed the need for more pasture. These farmers had approximately 2.5 acres of permanent pasture per roughage consuming animal unit, and had treated an average of 10 acres per farm. Seven of the 18 farmers who had an average of only 1.9 acres of permanent pasture per hay consuming animal unit rented additional pasture. Efforts were being made to improve the permanent pasture as rapidly as possible and thus reduce the amount of pasture rented.

Many of the farmers in the area have neglected to provide some type of supplementary pasture during the summer season when the permanent pastures are in a low state of production. Twenty of the 46 farmers provided no supplementary pasture for the livestock although this area is much better adapted to the production of pasture and hay than the production of grain. Supplementary pasture can be provided by pasturing meadows before or after the hay is cut. If this method does not furnish sufficient pasture the situation can be met by seeding once every four years the following mixture: 1/2 pound of ladino clover, 3 pounds of red clover, 5 pounds of alfalfa, and either 5 pounds of orchard grass, or 5 pounds of brome grass and 3 pounds of timothy. A temporary fence may be used to protect the seeding from the livestock during the first year. To prepare the soil to grow this pasture mixture, approximately 3 tons of ground limestone and 450 pounds of 0-14-6 fertilizer will be required for the initial treatment. For subsequent treatments 1/2 ton of ground limestone and 450 pounds of fertilizer are recommended when each seeding is made.

Problems Regarding Woodland Improvement

To most farmers the recommended forestry improvement programs appear less profitable than the crop improvement programs. In many cases this is due to the fact that trees require a long period of time before the crop can be harvested. Since the Soil Conservation Service furnished one-half of the barbed wire and all of the labor for constructing the fences to protect the woods from livestock, much more fence was built than would have been the case if the farmer had done it himself. Thirty-seven of the farmers stated that the woods would be protected from livestock, at least as long as the present fence is adequate.

Suggestions for Reorganizing Farms for Soil and Water Conservation

The preceding analysis of the 46 farms shows that some of the practices recommended by the Soil Conservation Service were not put into operation during the five-year period of the demonstration work. However, this situation should be considered in the light of the fact that in many cases the rapid adoption of a complete conservation program is neither economically feasible nor physically possible.

In reorganizing farms for soil and water conservation, consideration should be given to both the long-time and the short-time effects of adopting the necessary conservation measures. First of all, the various alternatives that might be used to control erosion and maintain the productivity of the soil should be considered with reference to the general farm organization that will produce the maximum net income. If the productivity of the soil cannot be maintained and still provide sufficient income for the operator the present unit must be considered submarginal from the standpoint of continued agricultural production.

In replanning farms with reference to soil and water conservation proper consideration should be given to the soil resources, livestock enterprises, and the farmer. The type of soil, topography, and the degree of erosion will determine the rotations that may be followed, and the mechanical measures that are necessary to control erosion. On the gentle slopes contour cultivation should be adequate, while on the steeper or eroded slopes contour strip cropping should be used. The substitution of hay for grain crops in the rotation will assist materially in maintaining the productivity of the soil and in controlling erosion. However, this shift in crops will result in the production of less grain and more hay.

If an increase in the proportion of hay is desirable for conserving the productivity of the soil, then consideration must be given to the efficient utilization of this crop if the conservation program is to be successful. In other words, the crop and livestock enterprises must be coordinated. Reductions in the acreage of grain may be partially offset by the use of hybrid corn, better care, or the increased application of commercial fertilizers. The feeding of more hay of higher quality should either

reduce the grain used or increase the production of the hay-consuming livestock. The production of high quality hay may be more difficult under conservation rotations which include two or more years of hay than under soil depleting rotations which consist of only one year of hay. For example, in a corn, wheat, meadow rotation the hay would be principally red or alsike clover even though a moderate amount of lime has been applied. On the same farm, in the case of a corn, wheat, meadow, meadow rotation the second-year hay would be principally timothy. If alfalfa mixtures of hay cannot be raised, consideration must be given to the utilization of the timothy meadows. For example, this crop might be either fed on the farm or sold, pastured, cut for seed, or plowed under to maintain the productivity of the soil. Probably none of these alternative uses of timothy hay would produce as high an income as would be the case if an alfalfa mixture of hay could be grown.

If the maximum amount of hay and the minimum amount of grain are to be fed to the roughage-consuming animals, the hay must be of the highest quality. Therefore, this crop must consist principally of legumes, and must be made at the proper time. The production of more hay will create the problems of providing more labor during the hay-making season and also more adequate storage space on some of the farms.

To make the conservation program effective, the livestock enterprises must consist principally of roughage-consuming animals in order to utilize the feed produced. Therefore, the type of livestock raised should be based on the cropping pattern necessary for conservation, instead of raising crops to meet the demands of the livestock without regard to the maintenance of the productivity of the soil.

From the short-time point of view considerable attention should be given to the farmer and his resources in replanning the present farm organization. For example, the farmer who has difficulty in meeting the present current operating expenses cannot be expected to increase his cash outlays as rapidly as the farmer who is in a more favorable economic position. In many cases the success of the proposed conservation programs will depend upon the methods used during the transition period from the

soil depleting to the soil conserving methods of farming.

On many farms the adoption of the proposed conservation programs must be spread over a period of years to be physically possible and economically feasible. For example, on some land lime must be applied during one or two rotations before a satisfactory stand of alfalfa can be obtained in the meadow mixtures. In many cases several years must elapse before the hay and pasture can be improved to the point where the maximum amount of roughage can be substituted for grain in the ration. Also rapid adjustments in the amount and type of livestock may be undesirable from the economic standpoint. In short, the success of a soil and water conservation program will depend upon the economic feasability of both the proposed program, and the plans for the transition period. Also, in reorganizing farms for conservation due consideration should be given to the farmer and his resources in an effort to coordinate the crop and livestock enterprises, and thus provide an effective farm organization that will maintain the farm as a producing unit.

SUMMARY

In this report consideration has been given to some of the successes and failures in reorganizing farms for soil and water conservation in the Granny-Dry Creek Demonstration Area at Mount Vernon, Ohio. This study which is based on the experience of 46 farmers stresses the importance of replanning farms with reference to both the short-time and the long-time point of view. Also, adequate consideration must be given to the soil resources, the livestock enterprises and the farmer in designing a sound soil and water conservation program. The experience of the farmers indicates that in many cases the adoption of a complete conservation program must cover a period of years in order to be physically possible as well as economically feasible. The success of the recommended conservation program was highly associated with the production of high quality roughage and the efficient utilization of this feed by the proper livestock enterprises. The failure to obtain high quality roughage, and the lack of proper coordination of the crop and livestock enterprises were the chief factors contributing to the failure of the recommended corn, wheat, meadow, meadow rotation. The return to the prevailing corn, wheat, meadow rotation reduced greatly the effectiveness of contour strip cropping and resulted in the discontinuance of this practice. Since some of the farmers failed to continue the recommended conservation program and returned to the prevailing methods of farming, the problem of soil and water conservation still remained unsolved on their farms.

APPENDIX

Table A.- Land Use per Farm on 33 Farms Where Farmers Plan to Follow a Corn, Wheat, Hay, Hay, Rotation Granny-Dry Creek Watershed

Crop	1936	1938	1939	1941	S.C.S. plans
Corn, grain	13.6	10.7	10.6	10.9	12.5
Corn, silage	1.6	1.5	.6	.1	-
Oats	3.4	.8	.8	2.7	-
Wheat	11.8	11.0	10.3	9.7	12.5
Soybean hay	4.3	.2	.9	.9	-
Alfalfa hay	.9	.2	2.0	1.6	-
Alfalfa-clover-timothy hay	.5	2.6	2.0	12.1	26.0
Clover hay	1.7	1.8	.8	.3	-
Clover-timothy hay	10.2	13.5	12.0	6.3	-
Legume silage	.0	.8	1.1	1.3	-
Timothy hay	1.8	3.6	5.3	3.4	-
Idle	.1	2.1	2.5	.8	-
Rotation pasture	.3	1.5	1.9	1.5	-
Total	50.2	50.3	50.8	51.6	51.0

Table B.- Land Use per Farm on 13 Farms Where Farmers Plan to Return to the Former Corn, Wheat, Hay, Rotation Granny-Dry Creek Watershed

Crop	1936	1938	1939	1941	S.C.S. plans
Corn, grain	15.5	10.0	11.1	12.5	11.5
Corn, silage	.8	1.1	1.1	.4	-
Soybean hay	2.6	.0	.8	1.3	-
Oats	3.6	.5	.0	2.4	-
Wheat	10.1	11.8	9.5	10.3	11.5
Alfalfa hay	.3	.5	.6	.2	-
Alfalfa-clover-timothy hay	.0	.6	1.5	3.0	23.8
Clover hay	3.2	7.0	.9	3.0	-
Clover-timothy hay	6.6	5.2	11.7	7.0	-
Timothy hay	1.5	2.4	2.3	2.2	-
Idle	.8	1.9	.9	.0	-
Rotation pasture	.2	2.8	2.5	.9	-
Total	45.2	43.8	42.9	43.2	46.8

Table C.- Animal Units of Livestock Per Farm on 33 Farms Where Farmers Plan to Follow a Corn, Wheat, Hay, Hay Rotation Granny-Dry Creek Watershed

Class	1936	1938	1939	1941
Horses	2.7	2.6	2.6	2.6
Dairy cows	8.3	7.9	8.1	8.7
Other cattle	4.2	4.3	5.2	6.3
Sheep	7.2	5.5	5.3	4.4
Total hay-consuming animals	22.4	20.3	21.2	22.0
Hogs	1.5	2.7	3.3	2.7
Poultry	1.6	1.6	2.3	2.4
Total	25.5	24.6	26.8	27.1

Table D.- Animal Units of Livestock Per Farm on 13 Farms Where Farmers Plan to Return to the Former Corn, Wheat, Hay Rotation Granny-Dry Creek Watershed

Class	1936	1938	1939	1941
Horses	2.5	2.7	2.6	2.5
Dairy cows	6.2	6.6	7.1	7.0
Other cattle	3.0	3.6	3.5	3.3
Sheep	8.0	7.0	6.6	7.4
Total hay-consuming animals	19.7	19.9	19.8	20.2
Hogs	1.2	2.5	2.0	3.0
Poultry	1.3	1.2	1.4	1.4
Total	22.2	23.6	23.2	24.6

Table E.- Labor and Power Demands [a] Under the Prevailing and Proposed Methods of Farming For a 118 Acre Farm, Granny-Dry Creek Watershed

Crop	Prevailing practices		Proposed practices	
	Man Hours	Horse hours	Man Hours	Horse hours
Corn	640	624	500	487
Wheat	144	224	112	175
Soybeans	78	132	0	0
Hay	102	144	197	270
Total	964	1124	809	932

[a] Based on labor standards in the following publication: Baker, R. H. - Labor Requirements for Crop Production in Ohio, Dept. of Rural Economics, Ohio State University, Mimeo. Bul. No. 115, 1938.